

## **High School Profiles of Mathematically Underprepared College Freshmen (Updated: May 10, 2011)**

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This paper reports on research into the high school experiences of freshmen entering the California State University, Chico over the seven-year period 2004-2010. During these years 3,147 first time freshmen matriculated from the Northern California service area. The mathematics high school histories of these students are compiled and analyzed. Characteristics of students who usually pass mathematics proficiency exams and those who do not are determined. Specific recommendations for action by school officials are made. We find that the greatest factor determining readiness for college level mathematics is not the senior year experience, but the highest level of mathematics attained in high school.

### **Background**

Throughout the country colleges and universities are forced to dedicate precious resources to provide mathematics remediation to students who successfully completed their required secondary coursework. Students who meet all of the requirements for admission to the university frequently fail minimal proficiency exams in English and mathematics. In California, nearly 40% of entering freshmen in the State University system require at least one semester of mathematics remediation. Understandably these students and their parents are frustrated to learn that their high school coursework somehow failed to properly prepare them for college level work. Similarly, university administrators are frustrated by the need to allocate scarce resources to complete the pre-college education of students which should have been provided by the secondary system. Many educators feel that minimal proficiency in mathematics and English should be an entrance requirement. In California this would not be consistent with the accessibility priorities of the State. Educators and politicians need to develop systems and policies that will better prepare the public school students for college level work.

### **Preliminary Data**

California State University, Chico experiences the same remediation needs typical throughout higher education. Over the 7 year period 2004-2010, CSU Chico enrolled 3147 freshmen who graduated from high schools in the Chico service area. This service area consists of most of the area of California above Sacramento and east of the Coastal Range. The area is primarily rural and Redding is the largest city with a population of just over 180,000. These students were required to take the Entry Level Mathematics (ELM) placement test, unless they were exempt by virtue of high scores on other standardized tests such as the ACT, SAT, or AP-Calculus exams. The ELM identified 1,089 or 34.6% as requiring mathematics remediation.

The high school mathematics courses and grades earned by these 3147 students were compiled from official high school transcripts. It was discovered that 1165 or 37.0% took no math at all their senior year. The CSU system currently recommends that all college bound seniors take mathematics in their senior year. While it is true that the percentages who need remediation and who take no math the senior year are similar, it turns out there is little relation between the two populations. Of the 1165 who took no math their senior year 466 or 40.0% required remediation. It would be helpful to discover more significant factors leading to full preparation for college level mathematics.

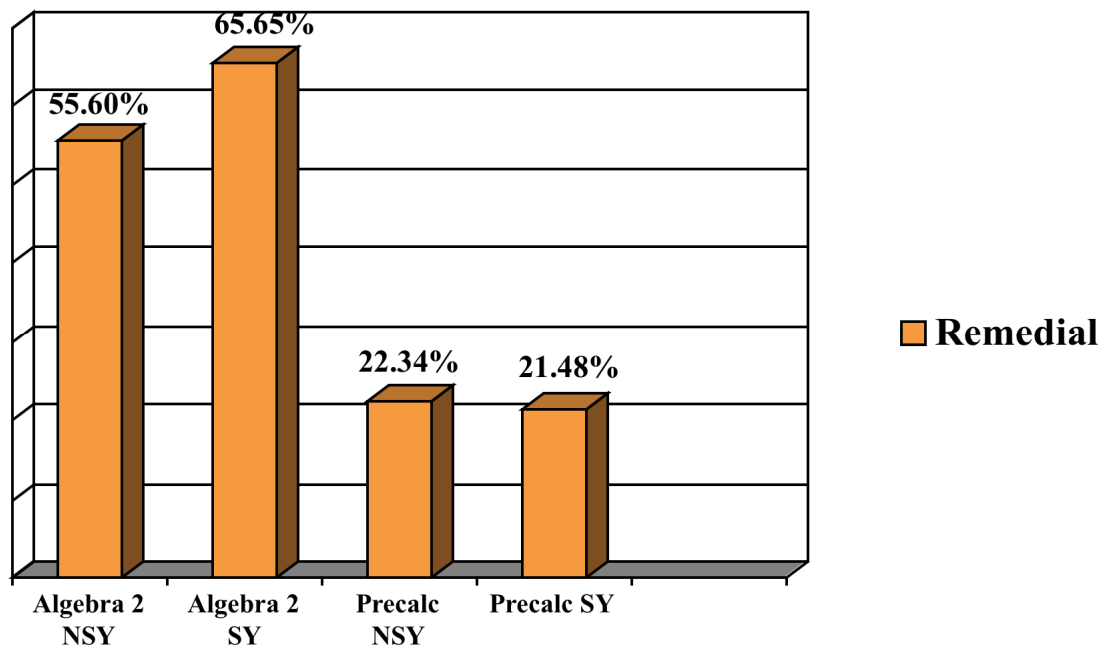
### Literature Review

Recent studies in other areas of the United States indicate that Algebra 2 is not sufficient preparation for college level mathematics. *Bridging the Gap* (Berry, 2003) reports on the high school preparation of 623 students attending North Arkansas College who attended local area high schools. Berry reports that 66% required remediation. She discovered that while 72% of students not going beyond algebra 2 required remediation, only 26% of students who took at least one more course required remediation! Other studies connecting high school preparation to college success support this result.

*Answers in the Toolbox* (Adelman, 1999) concludes: “Of all the components of curriculum intensity and quality, none has such an obvious and powerful relationship to ultimate completion of degrees as the highest level of mathematics one studies in high school...Finishing a course beyond the level of Algebra 2 more than doubles the odds that a student who enters postsecondary education will complete a bachelor’s degree.” This 15-year longitudinal study was conducted for the US Department of Education and included over 1.9 million college students.

### Study Data

Rather than “senior year math”, other studies indicate taking math beyond algebra 2 is most important. Our data presented below is consistent with this.



NSY = No Senior Year mathematics class SY = Senior Year math taken.

**Table 1:**

<b>All Students Enrolling at CSU Chico</b>	Total	# remedial	% remedial
Completed at least one Class beyond Algebra 2	2072	445	21.5%
Highest Class not beyond algebra 2	1075	639	59.44%

**Table 2:**

<b>Those who took math their senior year</b>			% remedial
Completed at least on Class beyond Algebra 2	1525	323	21.18%
Highest Class not beyond algebra 2	457	300	65.65%
<b>No senior year mathematics</b>			
Completed at least one Class beyond Algebra 2	546	122	22.34%
Highest Class not beyond algebra 2	619	344	55.57%
<b>TOTALS</b>	<b>3147</b>	<b>1089</b>	<b>34.60%</b>

### Conclusions and Recommendations

This data indicates that the senior year experience is not the most important factor. Consistent with the research of others, the highest level of mathematics attained in high school is a more critical issue predicting college readiness. We recommend that high school counselors, administrators, and teachers be made aware of these findings. We further recommend that school officials promote higher-level mathematics courses beyond algebra 2 for all university-bound students. Finally, we recommend that educators and politicians make a stronger commitment to developing greater numbers of highly qualified high school mathematics teachers.

### References

- Adelman, C. (1999). *Answers in the tool box: Academic intensity, attendance patterns, and bachelor's degree attainment*. Washington, DC: U.S. Government Printing Office. Chronicle of Higher Education. (2001, August). Almanac Issue. (<http://www.ed.gov/pubs/Toolbox/toolbox.html>)
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